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RESERVE

Water Supply Outlook For Washington



SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

Cooperating with

DEPARTMENT OF ECOLOGY STATE OF WASHINGTON

AS OF
June 1, 1982

TO RECIPIENTS OF WATER SUPPLY OUTLOOK REPORTS:

Most of the usable water in western states originates as mountain snowfall. This snowfall accumulates during the winter and spring, several months before the snow melts and appears as streamflow. Since the runoff from precipitation as snow is delayed, estimates of snowmelt runoff can be made well in advance of its occurrence. Streamflow forecasts published in this report are based principally on measurement of the water equivalent of the mountain snowpack.

Forecasts become more accurate as more of the data affecting runoff are measured. All forecasts assume that climatic factors during the remainder of the snow accumulation and melt season will interact with a resultant average effect on runoff. Early season forecasts are therefore subject to a greater change than those made on later dates.

The snow course measurement is obtained by sampling snow depth and water equivalent at surveyed and marked locations in mountain areas. A total of about ten samples are taken at each location. The average of these are reported as snow depth and water equivalent. These measurements are repeated in the same location near the same dates each year.

Snow surveys are made monthly or semi-monthly from January 1 through June 1 in most states. There are about 1900 snow courses in Western United States and in the Columbia Basin in British Columbia. Networks of automatic snow water equivalent and related data sensing devices, along with radio telemetry are expanding and will provide a continuous record of snow water and other parameters at key locations.

Detailed data on snow course and soil moisture measurements are presented in state and local reports. Other data on reservoir storage, summaries of precipitation, current streamflow, and soil moisture conditions at valley elevations are also included. The report for Western United States presents a broad picture of water supply outlook conditions, including selected streamflow forecasts, summary of snow accumulation to date, and storage in larger reservoirs.

Snow survey and soil moisture data for the period of record are published by the Soil Conservation Service by states about every five years. Data for the current year is summarized in a West-wide basic data summary and published about October 1 of each year.

Cover: Lone Cone, near Norwood, Colorado, blanketed by its winter mantle of snow.

PUBLISHED BY SOIL CONSERVATION SERVICE

The Soil Conservation Service publishes reports following the principal snow survey dates from January 1 through June 1 in cooperation with state water administrators, agricultural experiment stations and others. Copies of the reports for Western United States and all state reports may be obtained from Soil Conservation Service, West Technical Service Center, Room 510, 511 N.W. Broadway, Portland, Oregon 97209.

Copies of state and local reports may also be obtained from state offices of the Soil Conservation Service in the following states:

STATE	ADDRESS
Alaska	Room 129, 2221 East Northern Lights Blvd., Anchorage, Alaska 99504
Arizona	Room 3008, Federal Building, 230 N. First Ave., Phoenix, Arizona 85025
Colorado (N. Mex.)	P. O. Box 17107, Denver, Colorado 80217
Idaho	Room 345, 304 N. 8th. St., Boise, Idaho 83702
Montana	P. O. Box 98, Bozeman, Montana 59715
Nevada	P. O. Box 4850, Reno, Nevada 89505
Oregon	1220 S. W. Third Ave., Portland, Oregon 97204
Utah	4420 Federal Bldg., 125 South State St., Salt Lake City, Utah 84138
Washington	360 U. S. Court House, Spokane, Washington 99201
Wyoming	P. O. Box 2440, Casper, Wyoming 82602

PUBLISHED BY OTHER AGENCIES

Water Supply Outlook reports prepared by other agencies include a report for California by the Snow Surveys Branch, California Department of Water Resources, P.O. Box 388, Sacramento, California 95802 --- for British Columbia by the Ministry of the Environment, Water Investigations Branch, Parliament Buildings, Victoria, British Columbia V8V 1X5 --- for Yukon Territory by the Department of Indian and Northern Affairs, Northern Operations Branch, 200 Range Road, Whitehorse, Yukon Territory Y1A 3V1 --- and for Alberta, Saskatchewan, and N.W.T. by the Water Survey of Canada, Inland Waters Branch, 110-12 Avenue S.W., Calgary, Alberta T3C 1A6.



WATER SUPPLY OUTLOOK FOR WASHINGTON

and
FEDERAL - STATE - PRIVATE COOPERATIVE SNOW SURVEYS

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WATER SUPPLY OUTLOOK

State of Washington

June 1, 1982

The water supply outlook for the State of Washington as of June 1 can be considered good. We have had a cold, dry May and runoff has been near normal. Our snow packs, the few that were measured in the State of Washington, indicate near normal conditions as of June 1. But our high elevation tributary measurements show that the melt-off has been delayed and we still have well above normal snowpacks in the high country. This is especially true in British Columbia and Western Montana. In British Columbia, of the nearly one-hundred snow course measurements received in this office, only one had a subnormal amount of snow water equivalent. Reservoirs seem to be in reasonable shape. Irrigation reservoirs have 13 percent more water than normal for this time of year and power reservoirs 4 percent less. All reservoirs are being managed for retention of expected spring runoff.

THIS IS THE LAST WATER SUPPLY REPORT FOR 1982. IF YOU WISH TO RECEIVE THESE REPORTS NEXT YEAR, PLEASE RETURN THE BACK COVER OF THE APRIL 1 REPORT IF YOU HAVE NOT ALREADY DONE SO.

SNOW COVER

As stated above, very few snow courses were measured on June 1. Slightly more were measured as of May 15 and the results of these measurements are reported herein. Summarizing the measurements in the Pend Oreille drainage shows an increase of 8 percentage points from May 15 to June 1. The snowpack in the Kettle River drainage increased 59 percentage points, but the Okanogan decreased 85 percentage points. These percentage figures are really not significant but are presented for information only. In the Entiat drainage, measurements are not made on May 15 but the June 1 snow course readings average out 7 percent above normal. The same is true for the Wenatchee drainage, except the snowpack there is exactly normal. In the Yakima drainage, no measurements were made on June 1, but the May 15 readings indicate the snowpack to be 8 percent less than average.

PRECIPITATION

Rainfall that occurs at both high and low elevations is the key factor for the June 1 water supply outlook. If above normal precipitation occurs and the temperatures are warm, then the melt is increased and flooding usually occurs. This year, we have had very little rainfall throughout the whole Columbia basin and only that portion of the drainage division called Columbia Above Castlegar had above normal rainfall and this by only one percentage point. The other drainage divisions, as reported by the National Weather Service, were all very much subnormal with Southeastern Washington and Southwest Slope Cascades having 61 percent below average rainfall during the month. The seven drainage divisions reported by the National Weather Service show that the other drainage divisions had from 41 to 84 percent of normal rainfall during the month of May. It is interesting to note that along the East Slopes of the Cascades, which includes all of the Cascades from Okanogan through the Yakima, precipitation was exactly the same, percentagewise, as last month.

RESERVOIRS

The reservoirs as tabulated in this report indicate the irrigation reservoirs have a considerable amount of water in storage. Only Lake Cle Elum still is questionable as to whether it will fill or not. As previously stated, water from Lake Cle Elum has been released as a result of court orders to supply downstream fish water. The power reservoirs, with the exception of Lake Couer d'Alene, have generally subnormal amounts of water in storage, but these are being managed for filling with the subsequent spring runoff.

STREAMFLOW

Runoff figures, as reported by the Bureau of Reclamation and individual power companies, indicate near normal conditions occurred throughout the state with a few streams showing subnormal flows while most showed normal or slightly above. The range is from 8 percent below normal for the Lewis River to 20 percent above for the Yakima as measured at Cle Elum. Forecasts are not made as of June 1. Percentage flows are expected to be the same as that which was forecast on May 1.

RESERVOIR STORAGE - 1000 Acre Feet

BASIN OR STREAM	RESERVOIR	USABLE ^{1/} CAPACITY	1982	1981	Measured June 1 1980	Normal*
<u>COLUMBIA</u>						
Spokane	Coeur d'Alene Lake	225.1	283.0	213.7	242.5	225.0
Columbia	Franklin D. Roosevelt Lake	5232.0	2340.5	4845.6	5058.7	2565.6
Columbia	Banks Lake	714.9	632.0	672.2	680.2	406.2
Okanogan	Conconully Reservoir	13.0	13.1	13.2	13.0	9.1
Okanogan	Conconully Lake	10.5	10.4	10.4	10.5	9.4
Chelan	Lake Chelan	676.1	391.7	653.5	570.6	450.6
<u>YAKIMA</u>						
Yakima	Keechelus Lake	157.8	149.2	147.4	147.1	139.6
Kachess	Kachess Lake	239.0	229.6	237.2	163.0	217.1
Cle Elum	Lake Cle Elum	436.9	326.5	436.4	436.2	367.9
Bumping	Bumping Lake	33.7	29.8	33.1	33.4	25.4
Tieton	Rimrock Lake	198.0	189.8	193.2	198.8	160.2
<u>PUGET SOUND</u>						
Skagit	Ross Reservoir	1404.1	855.6	1362.1	1129.5	1033.9
Skagit	Diablo Reservoir	90.6	87.4	86.7	85.1	86.1
Skagit	Gorge Reservoir	9.8	7.9	7.9	7.2	8.3

^{1/} Based on Active Storage

* 15-yr. Average 1963-1977

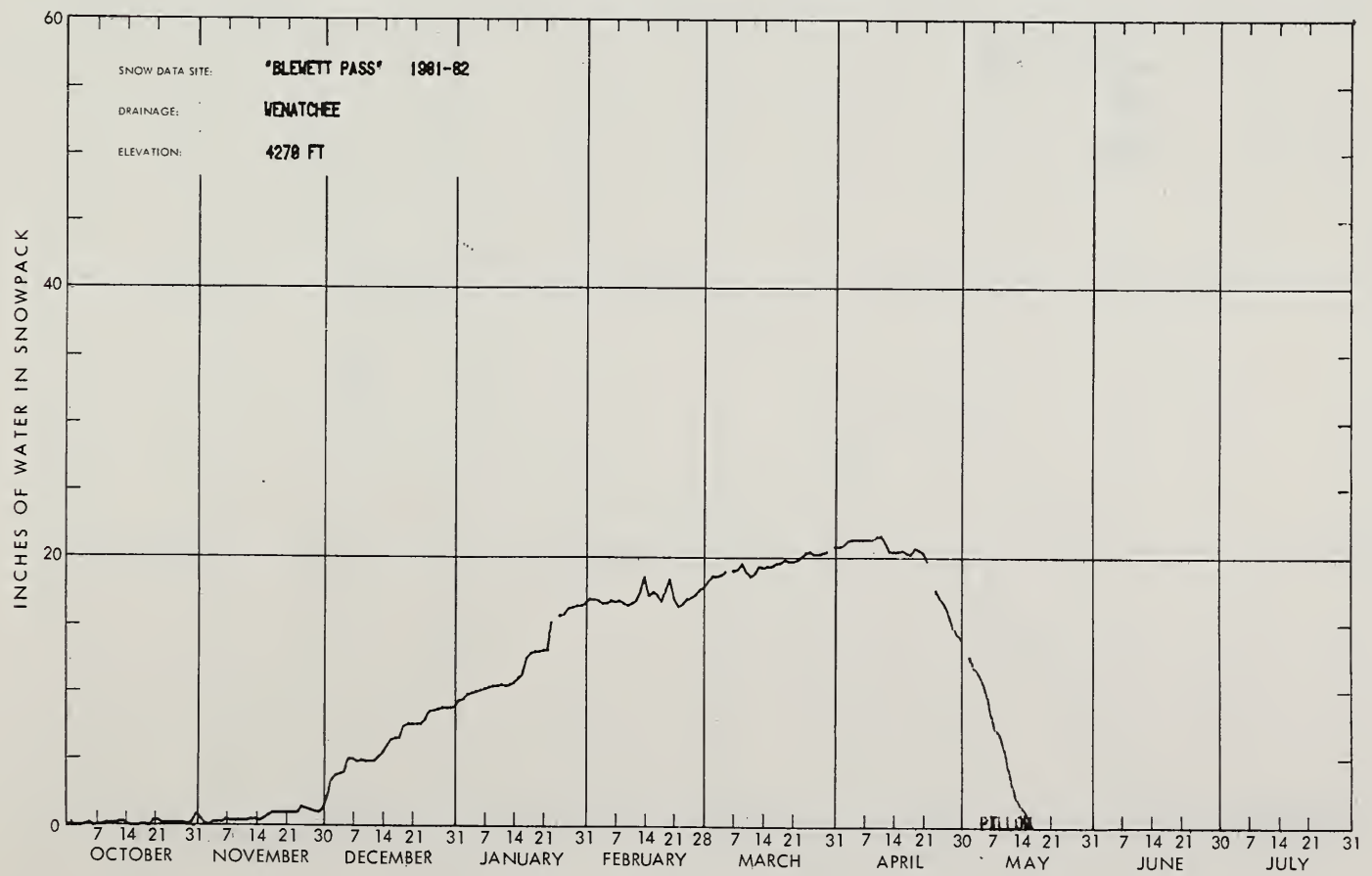
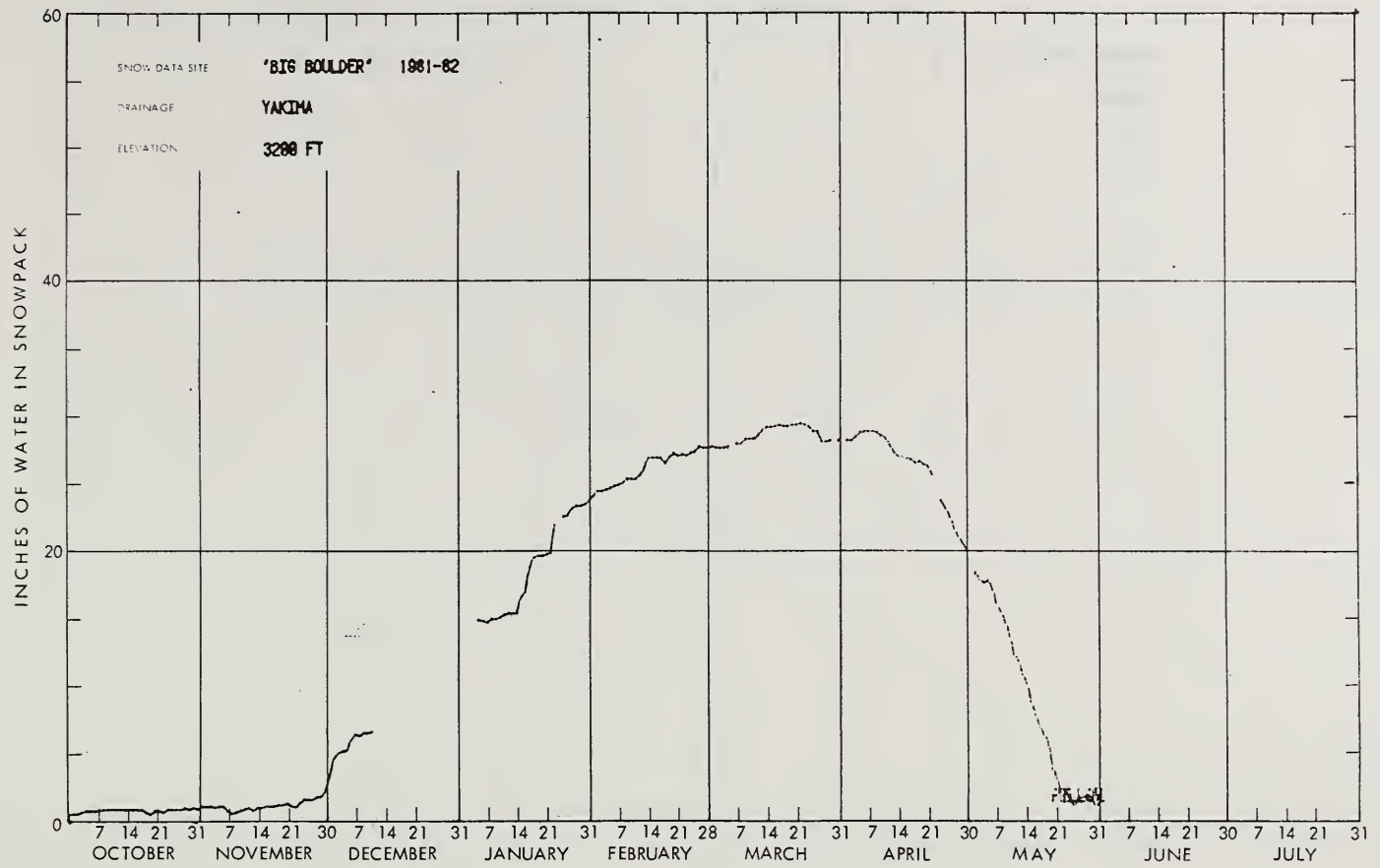
PRECIPITATION 1/
Division Average Observations and Departures

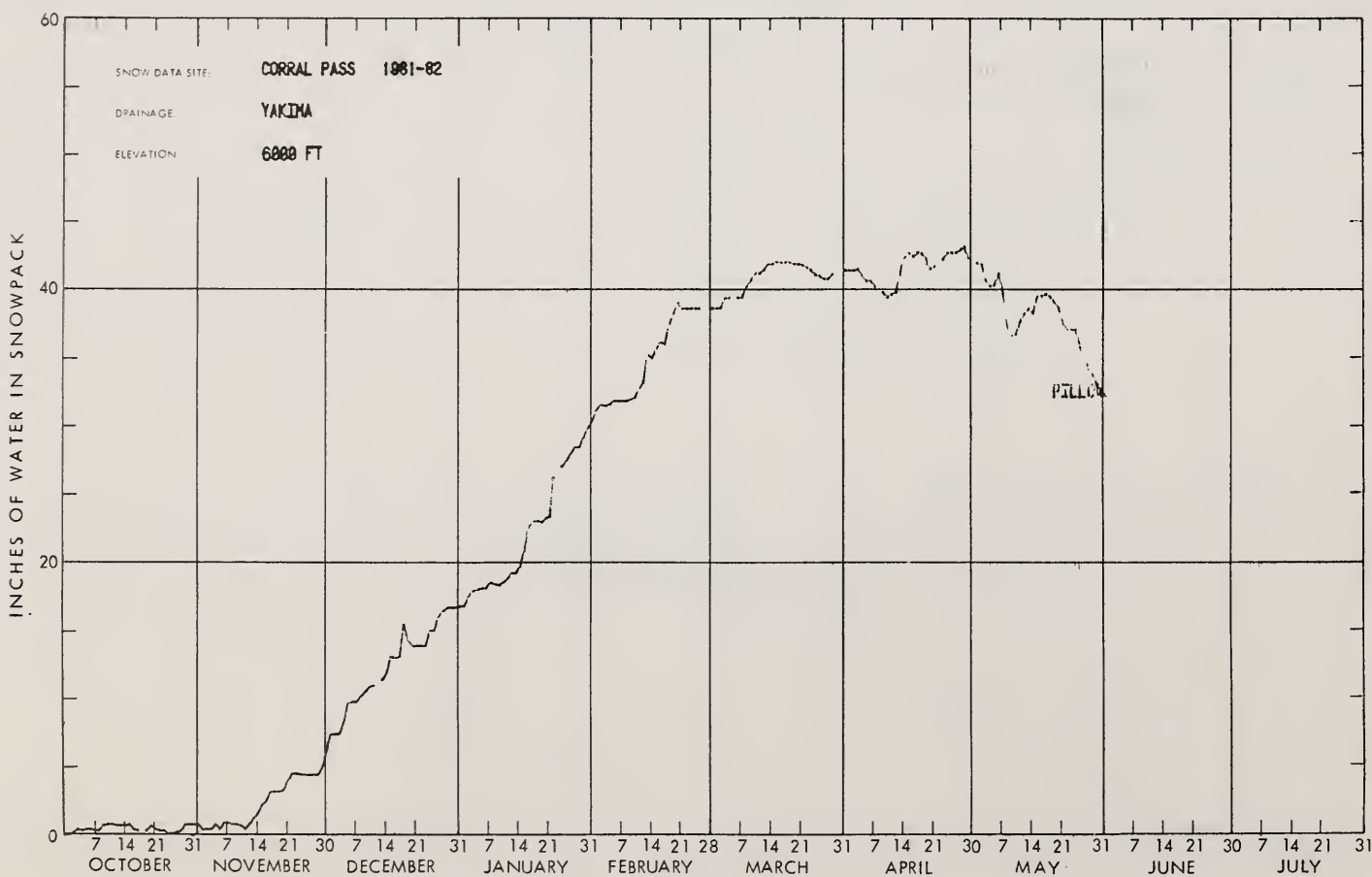
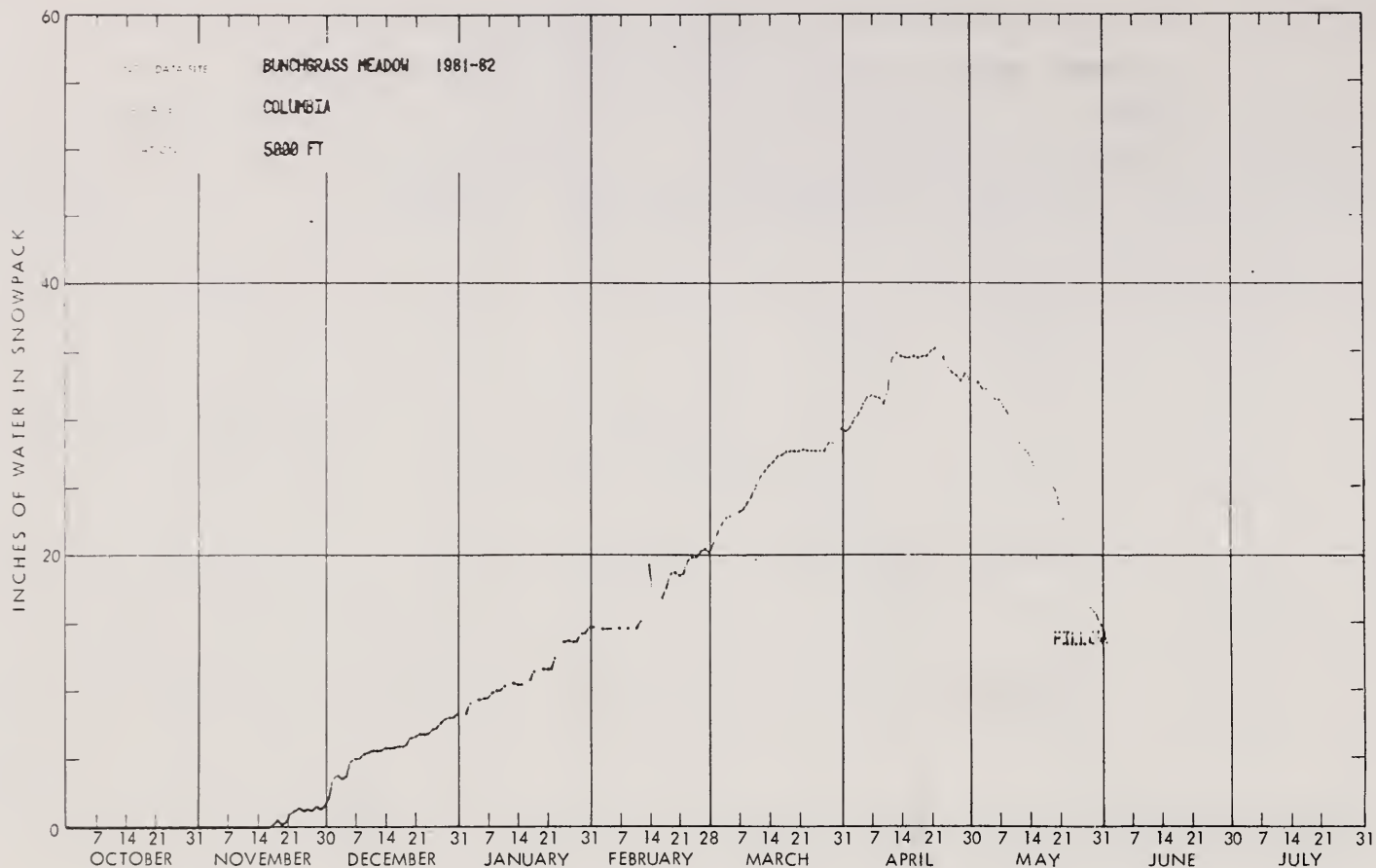
Drainage Divisions	FALL		WINTER		SPRING	
	Sept-Oct Observed	1981 <u>2/</u> Departure	Nov 1981 - Mar 1982 Observed	Departure	Apr-May 1982 Observed	<u>2/</u> Departure
Columbia in Canada	5.17	+0.15	17.05	+1.54	2.97	-0.50
Pend Oreille - Spokane	3.56	-0.48	19.70	+2.15	4.27	+0.42
Northeastern Washington	3.28	+0.80	10.12	+0.72	2.25	-0.76
Southeastern Washington	3.03	+0.52	12.95	+2.52	2.39	-0.54
Central Washington	4.87	+0.12	32.22	+4.69	2.77	-0.72
North Central Washington	2.61	+1.02	7.28	+0.74	1.08	-0.69
Northwest Slope Cascades	13.88	+0.67	59.27	+3.88	7.31	-3.09
Southwest Slope Cascades	9.98	+1.30	45.31	+3.67	6.25	-1.05

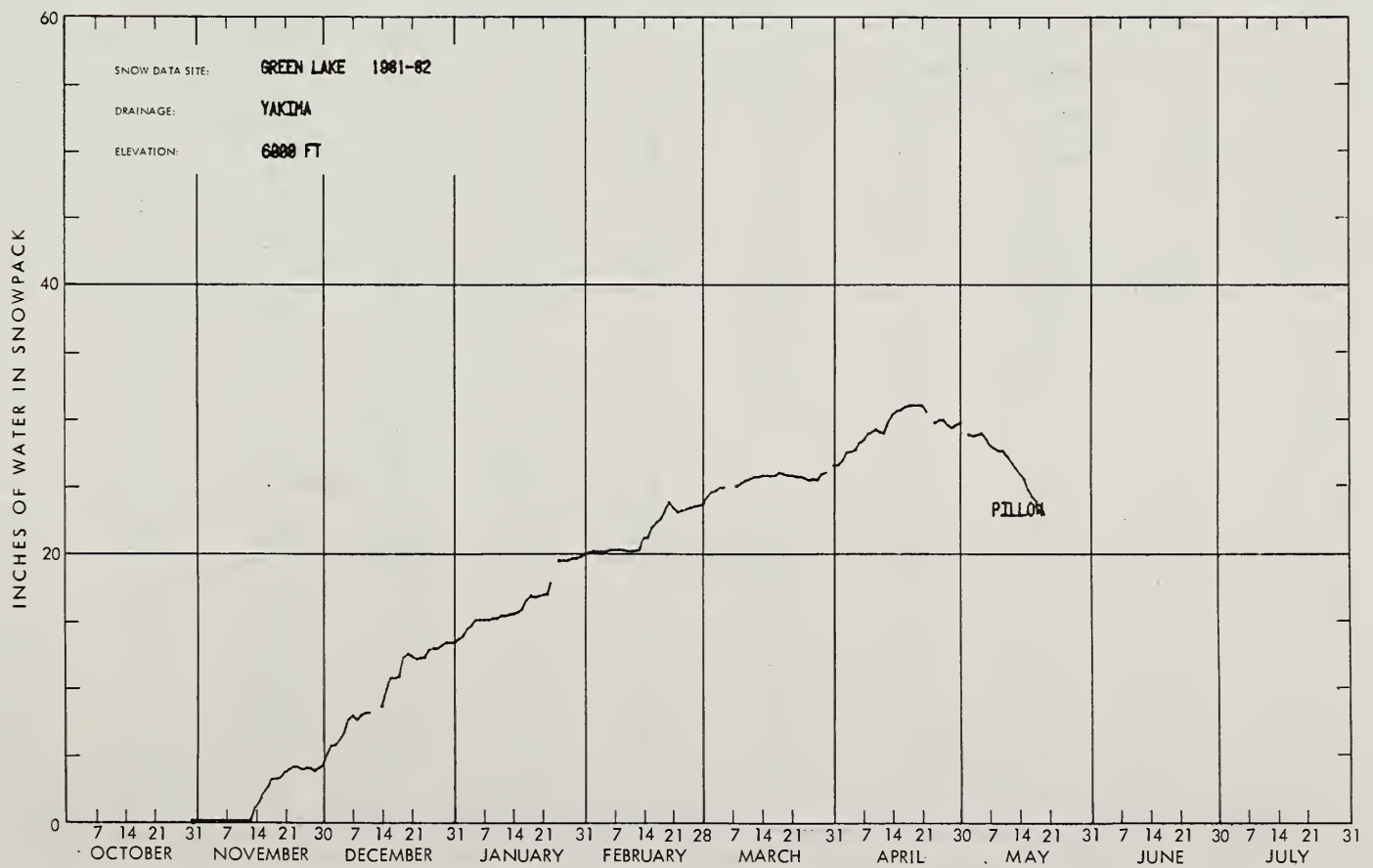
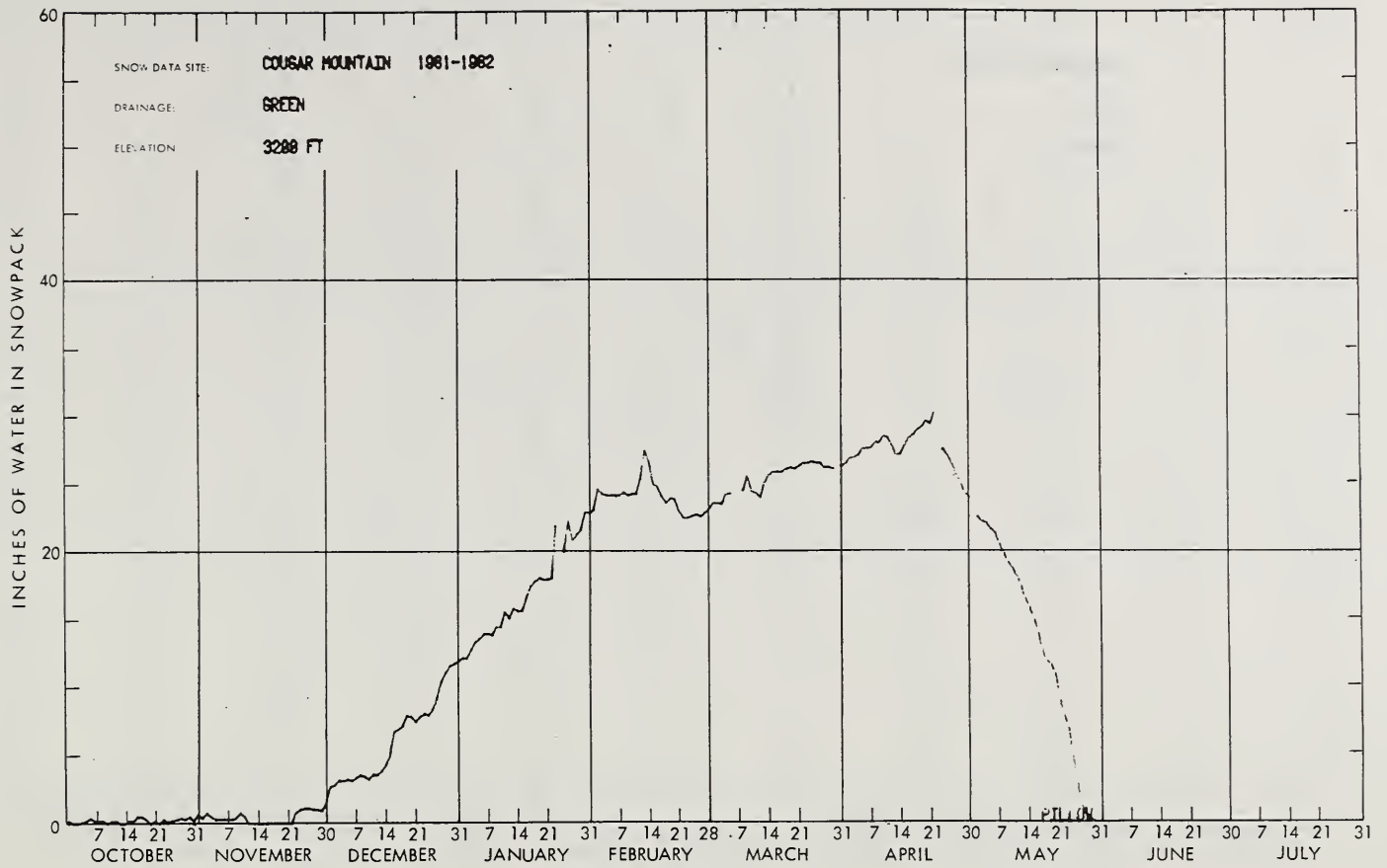
Northeastern Washington	- Lower Spokane, Colville, Sanpoil, and Lower Kettle Drainages.
Southeastern Washington	- Touchet, Tucannon, and Palouse Drainages.
Central Washington	- Yakima, Wenatchee, and Chelan Drainages.
North Central Washington	- Methow and Okanogan Drainages.
Northwest Slope Cascades	- Puget Sound Drainages.
Southwest Slope Cascades	- Lower Columbia Drainages.

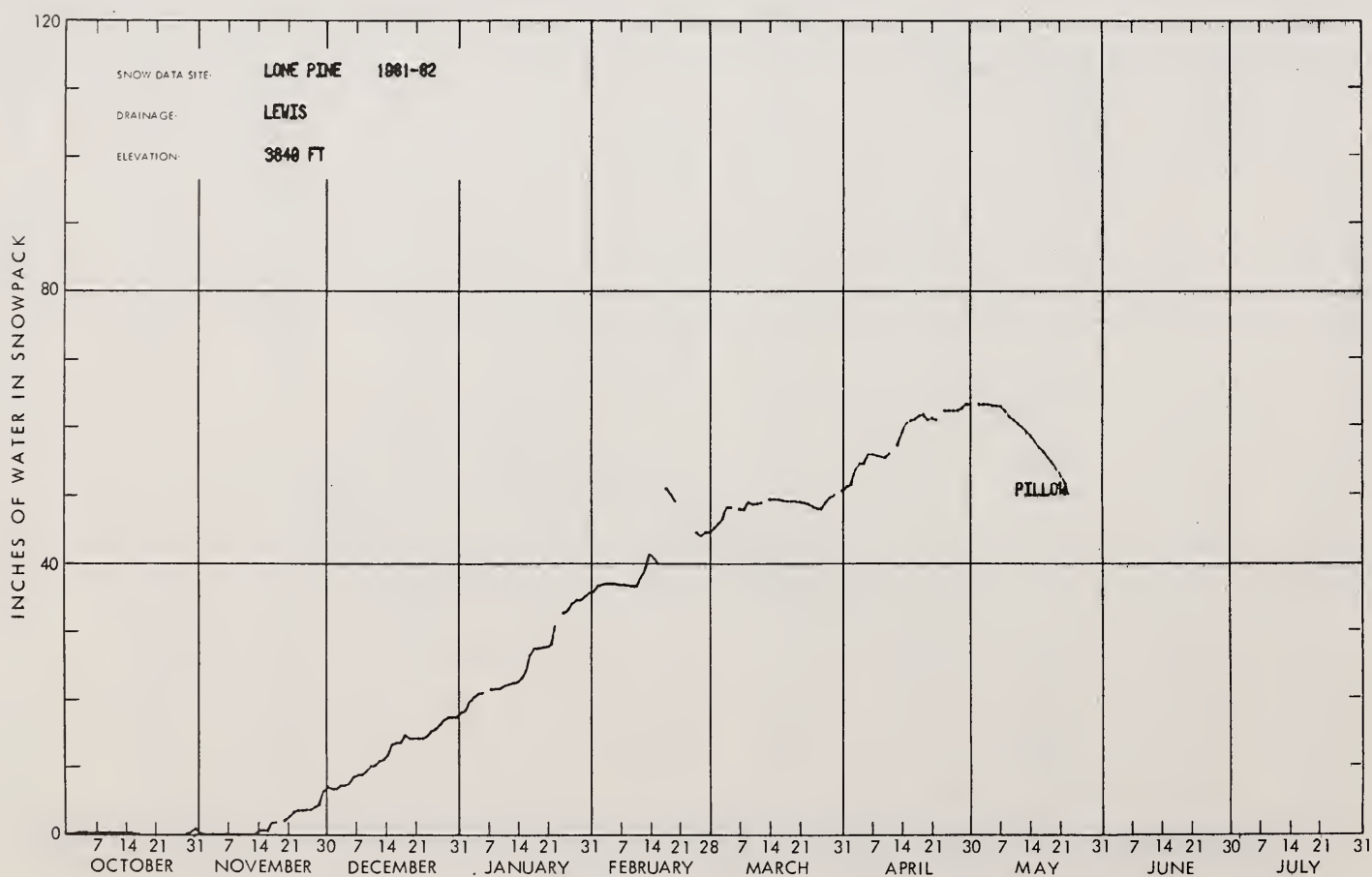
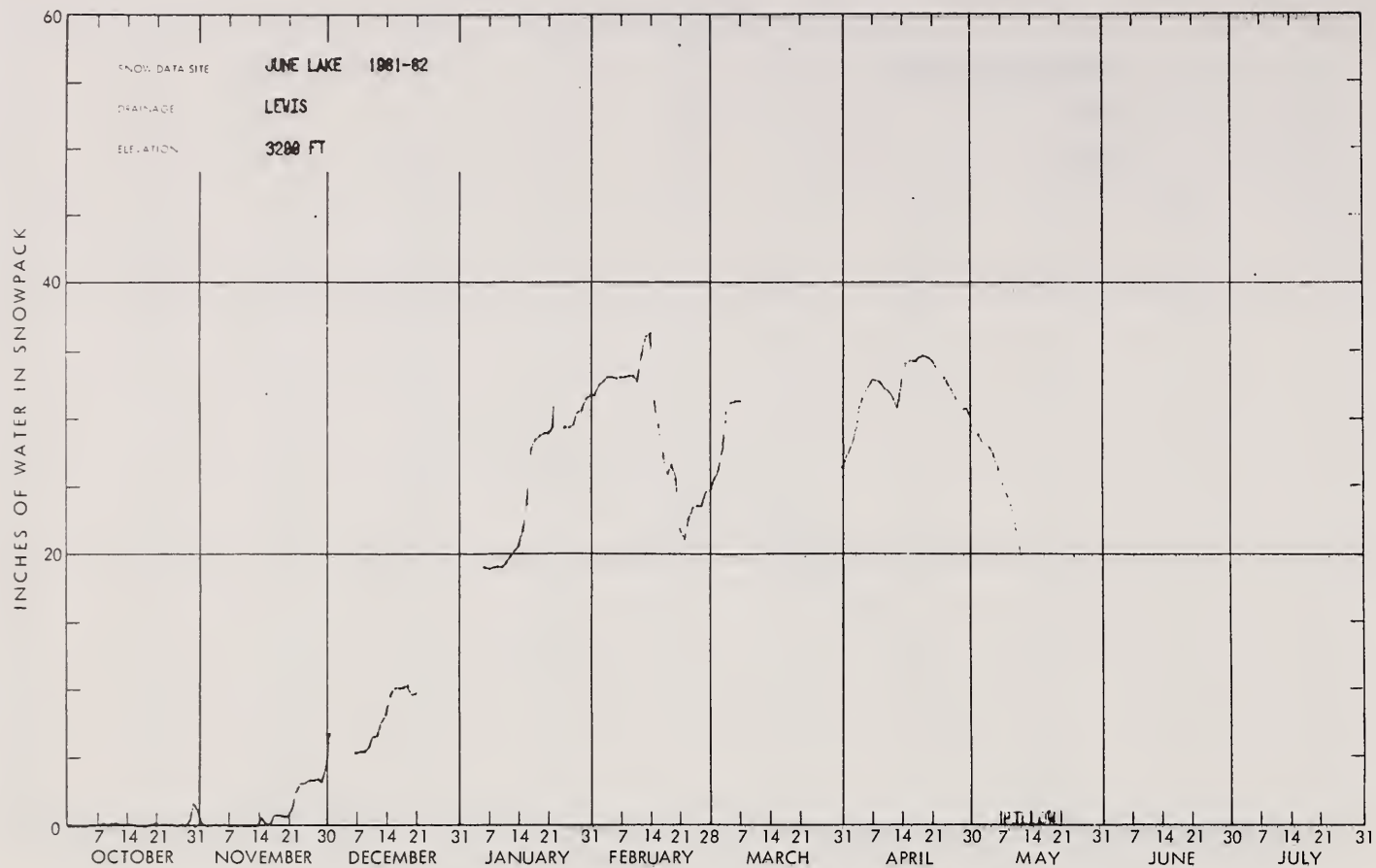
1/ - Preliminary analysis by National Weather Service from data furnished by Meteorological Services of Canada and the National Weather Service.

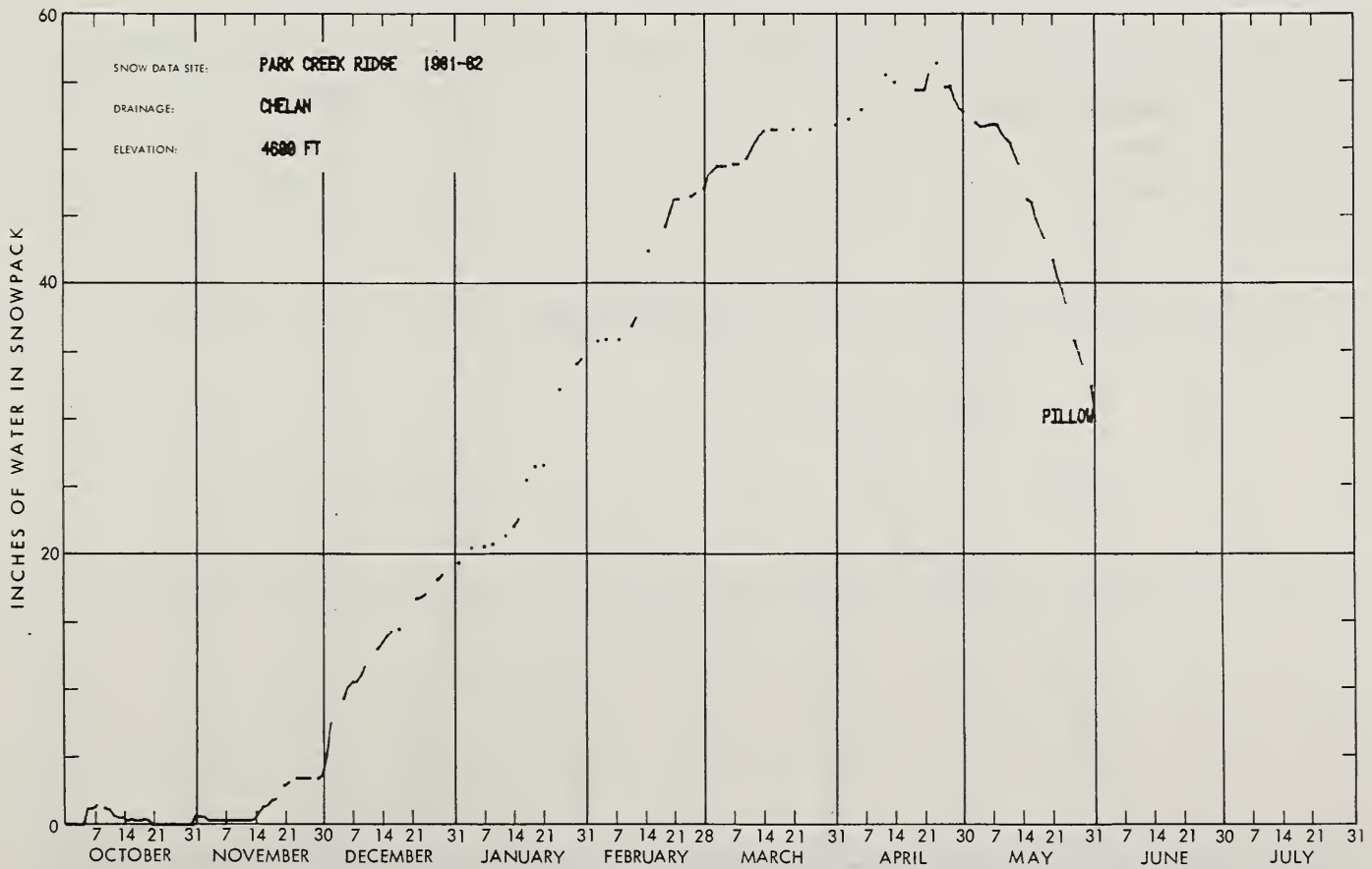
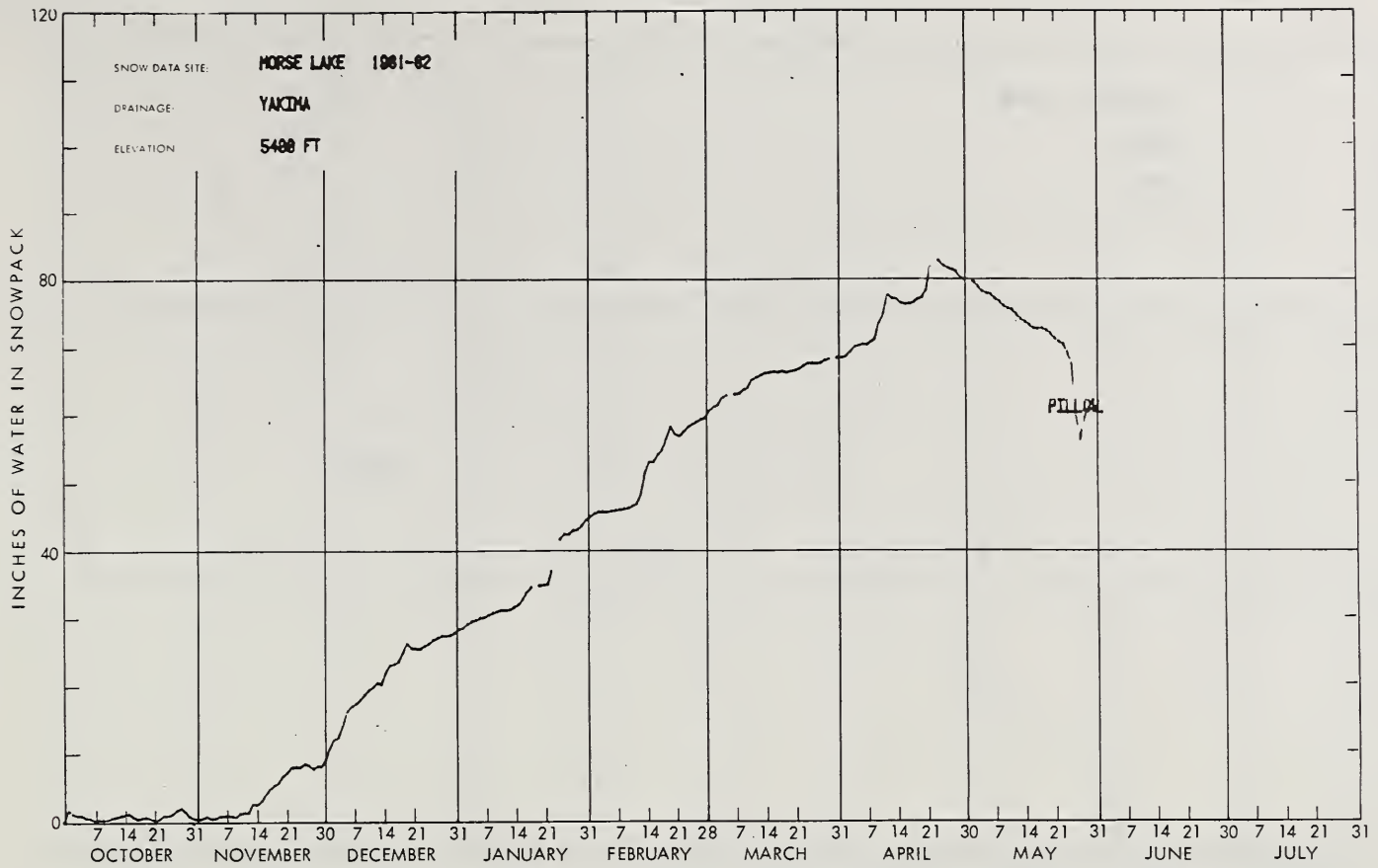
2/ - Departure from 15-year (1958-72) drainage division average.

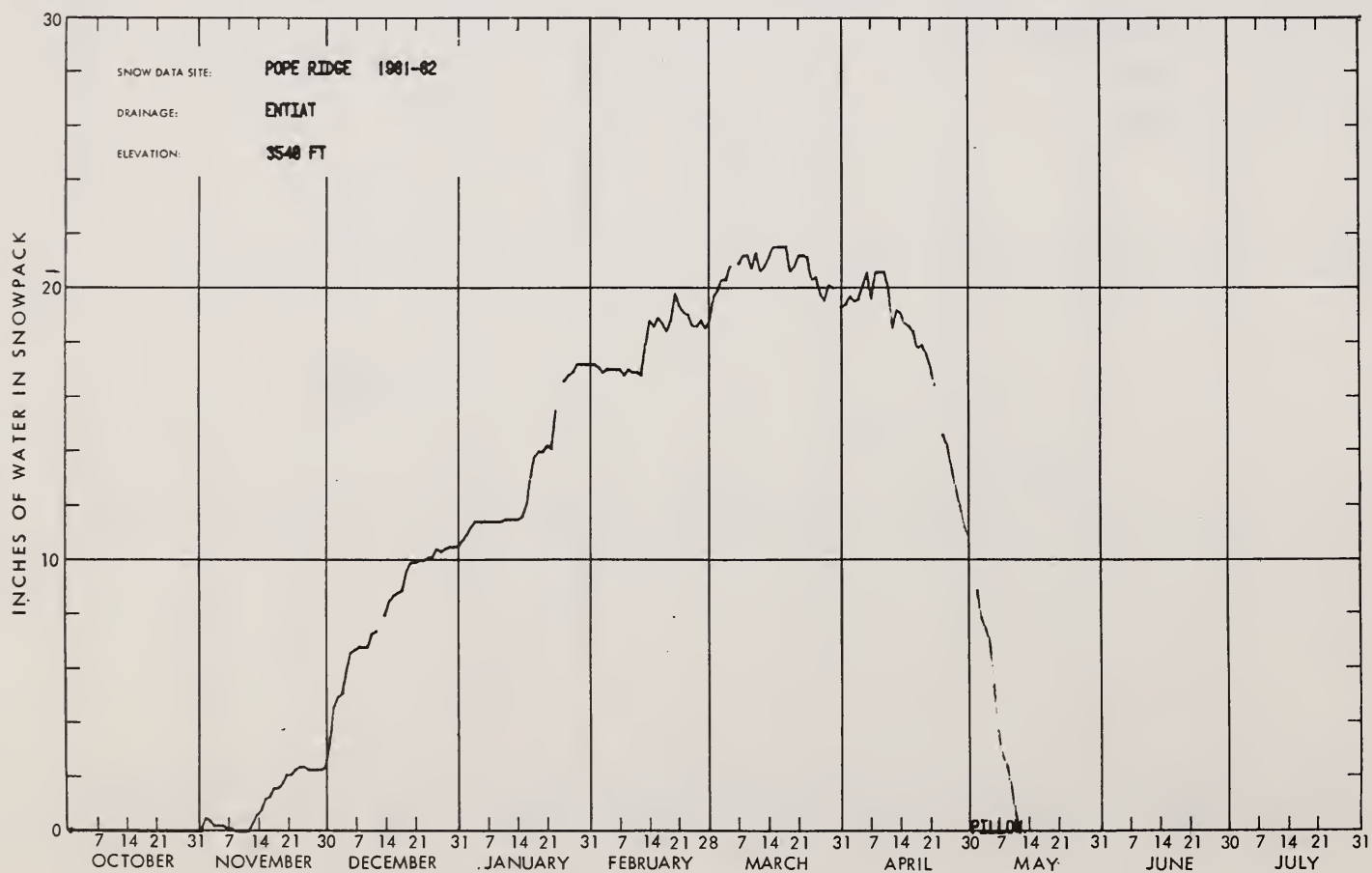
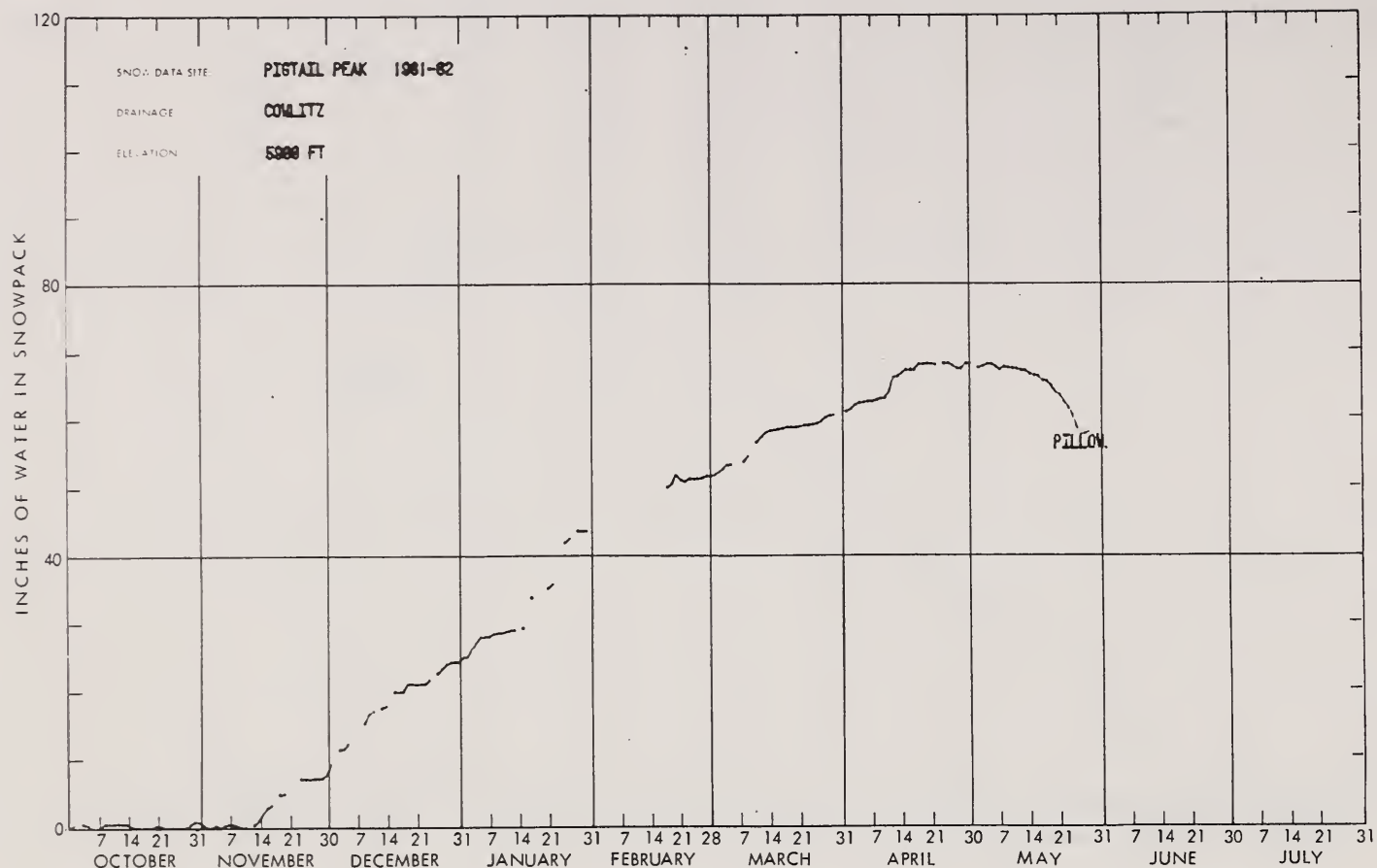


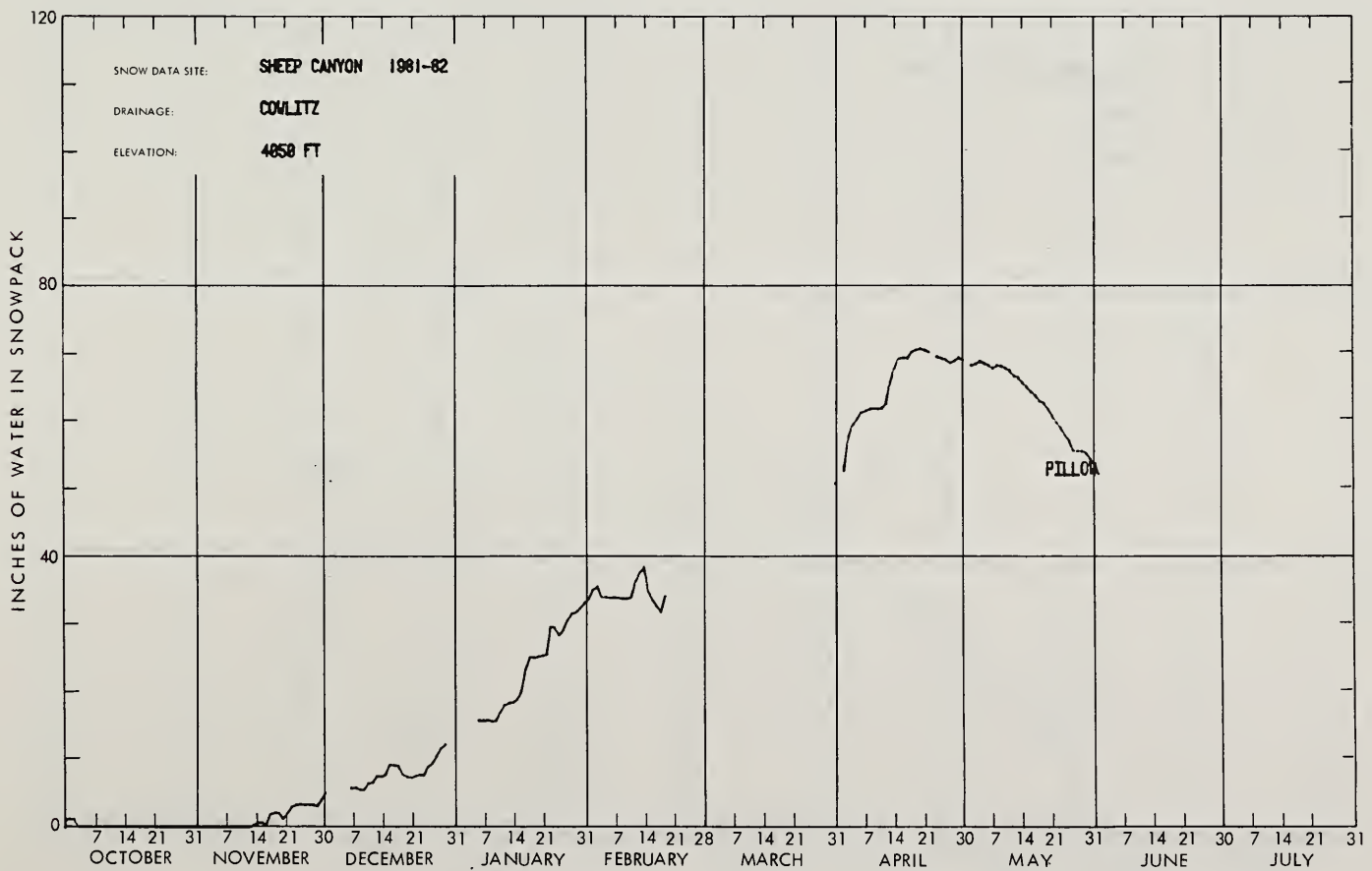
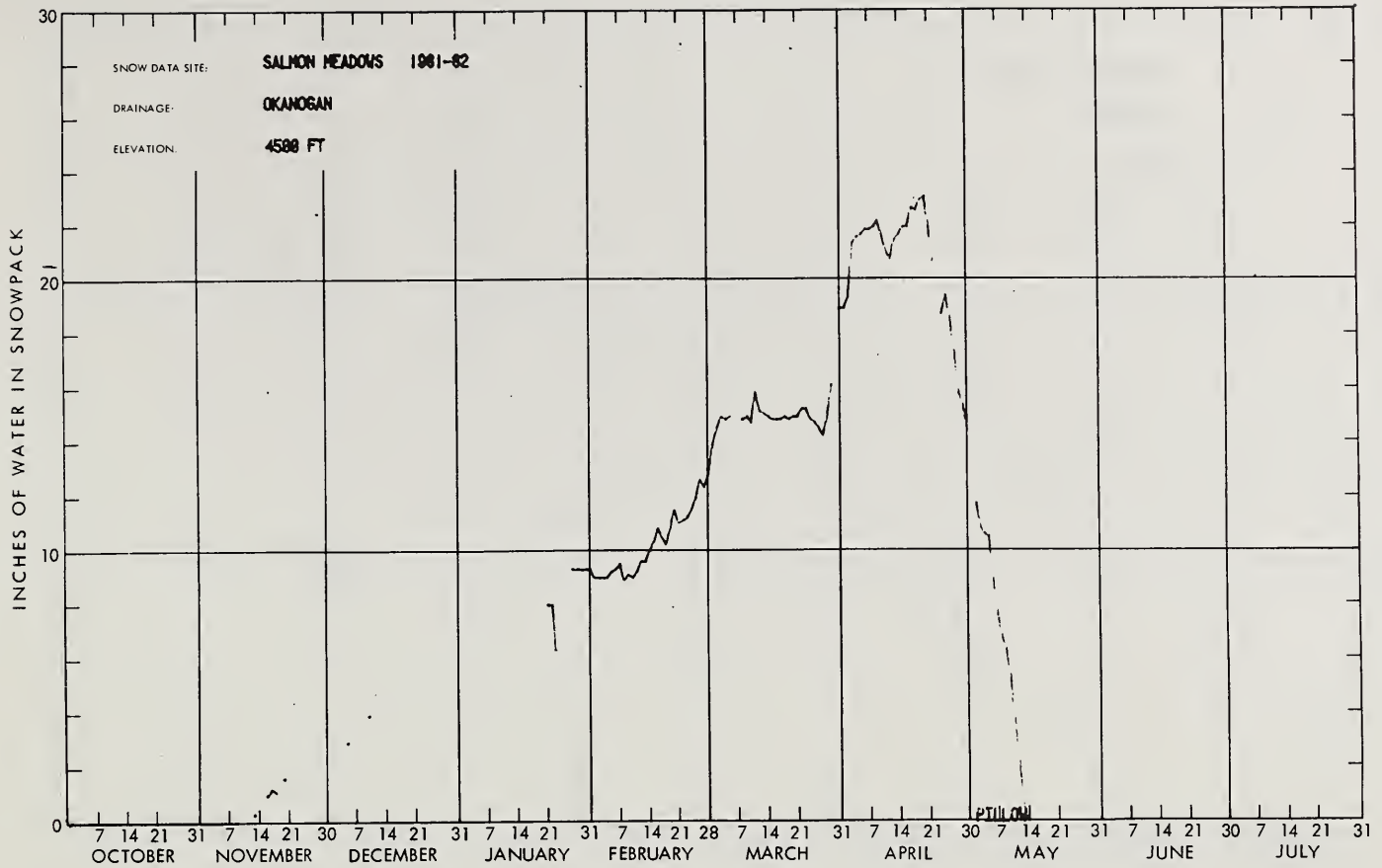


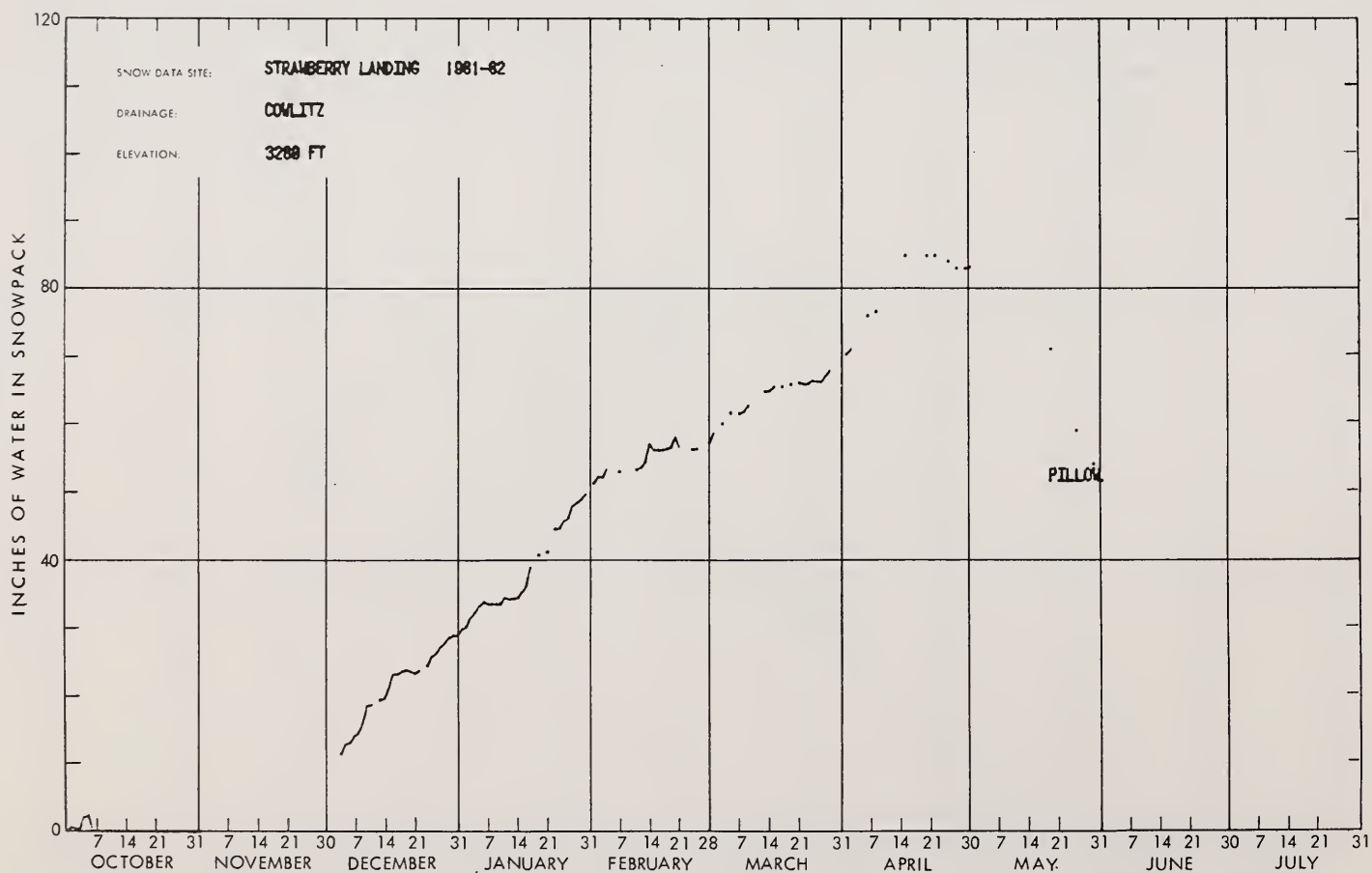
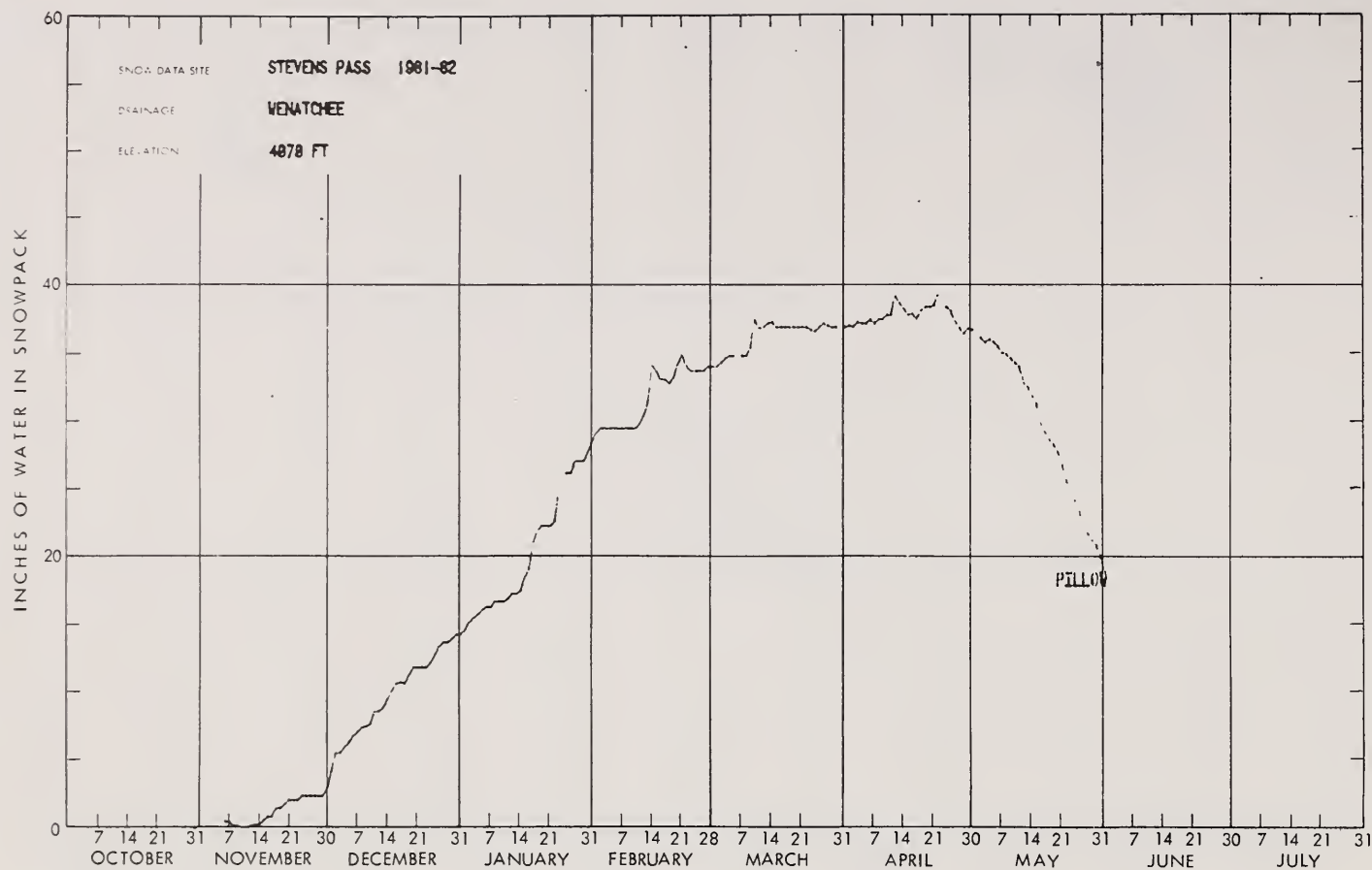


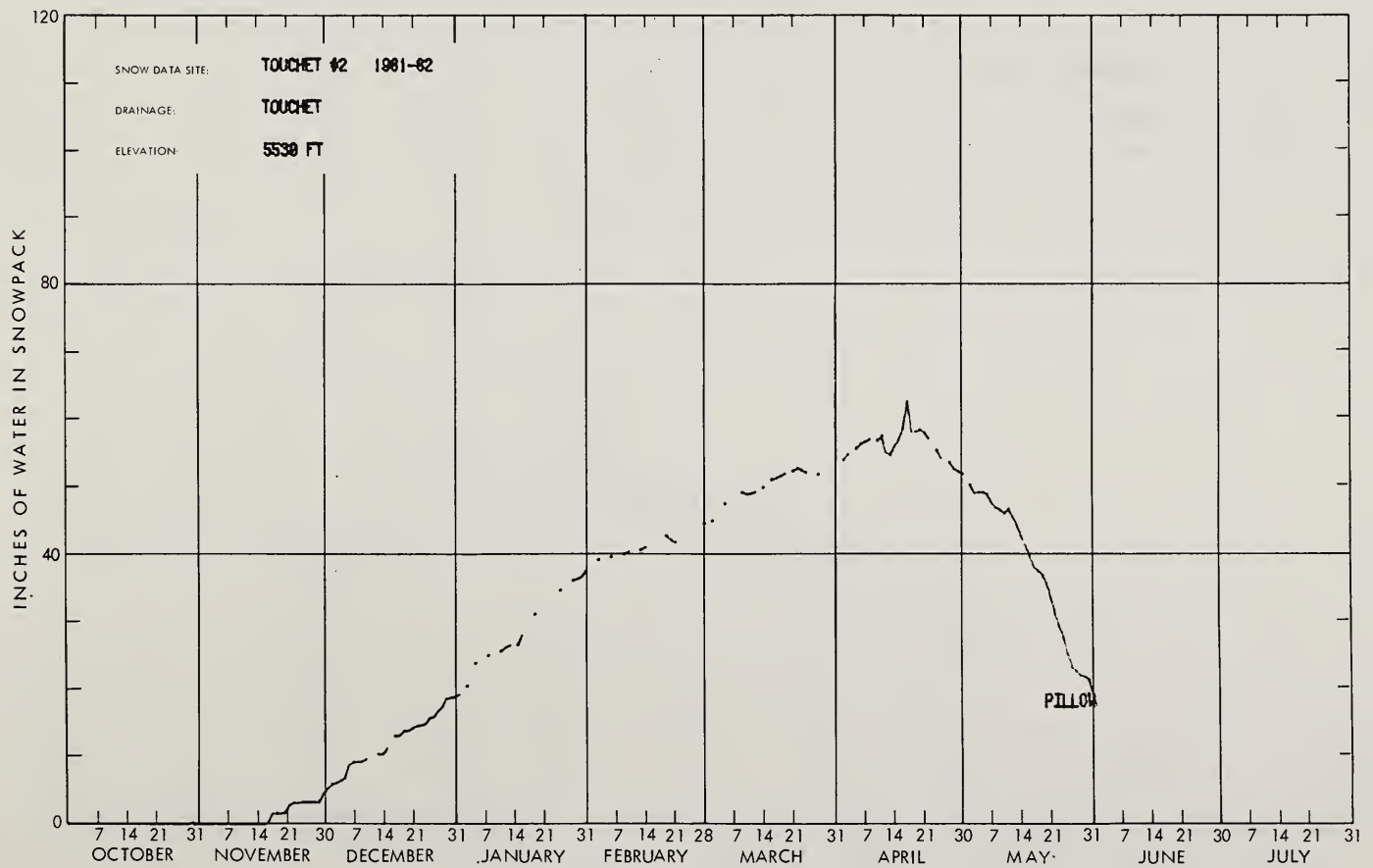
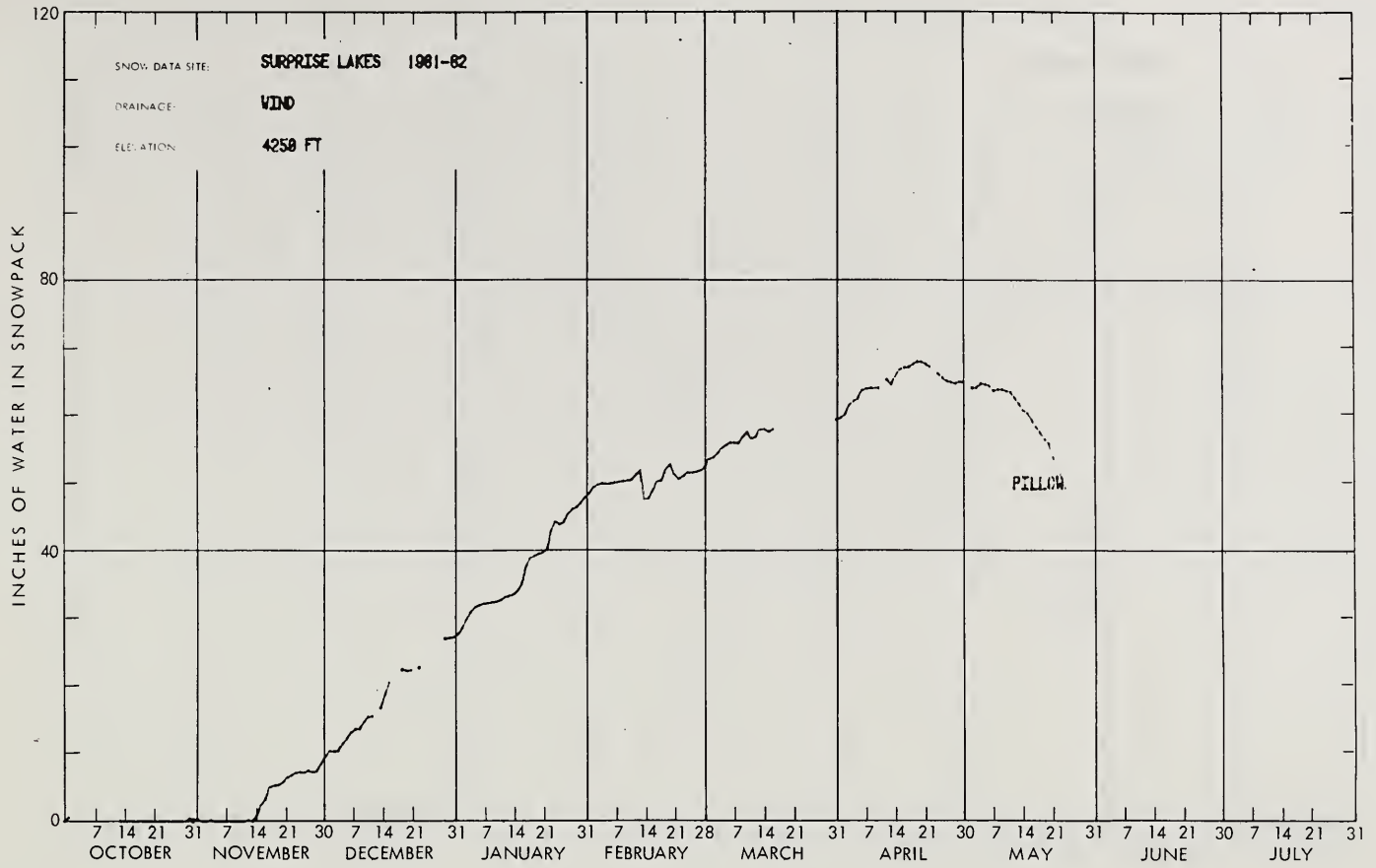


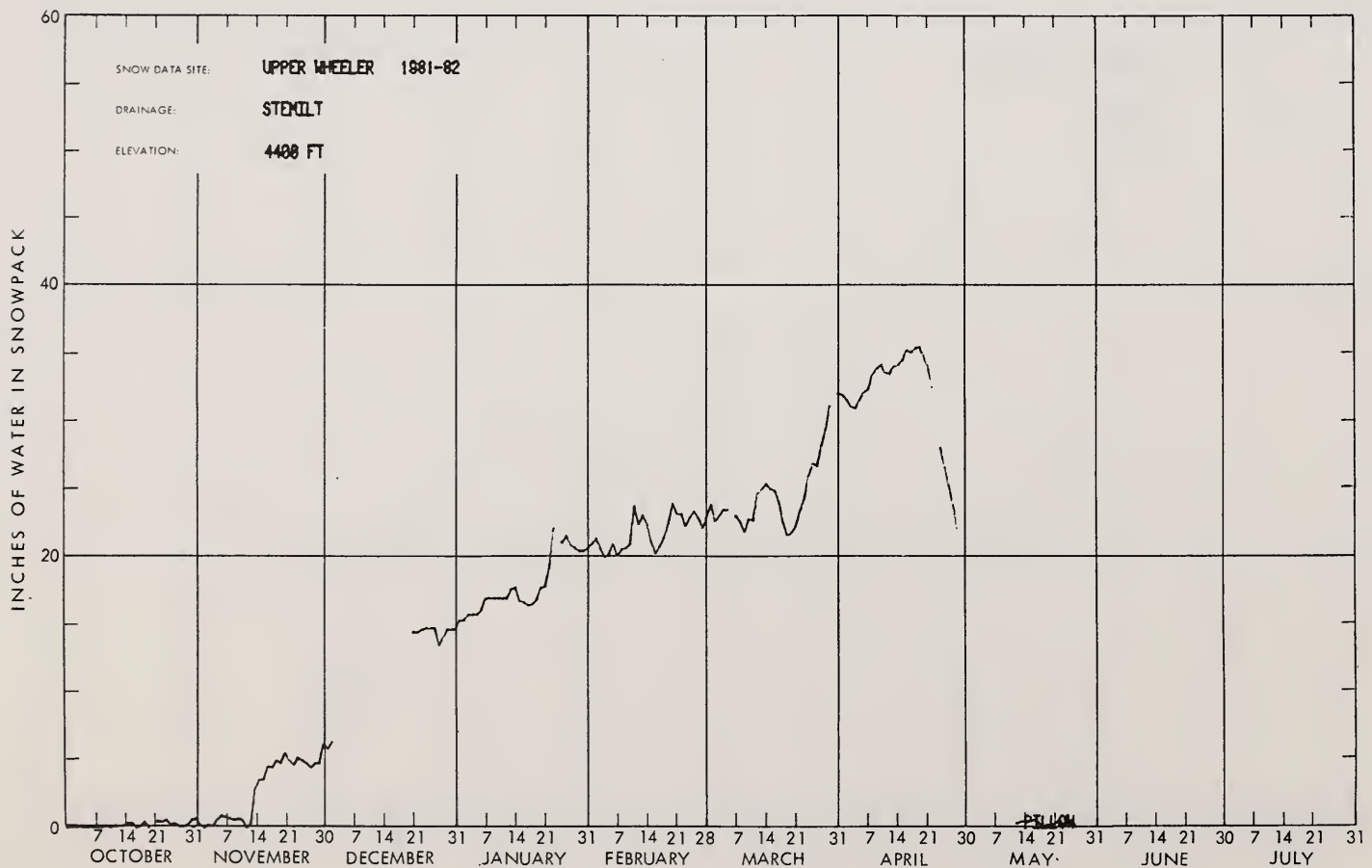
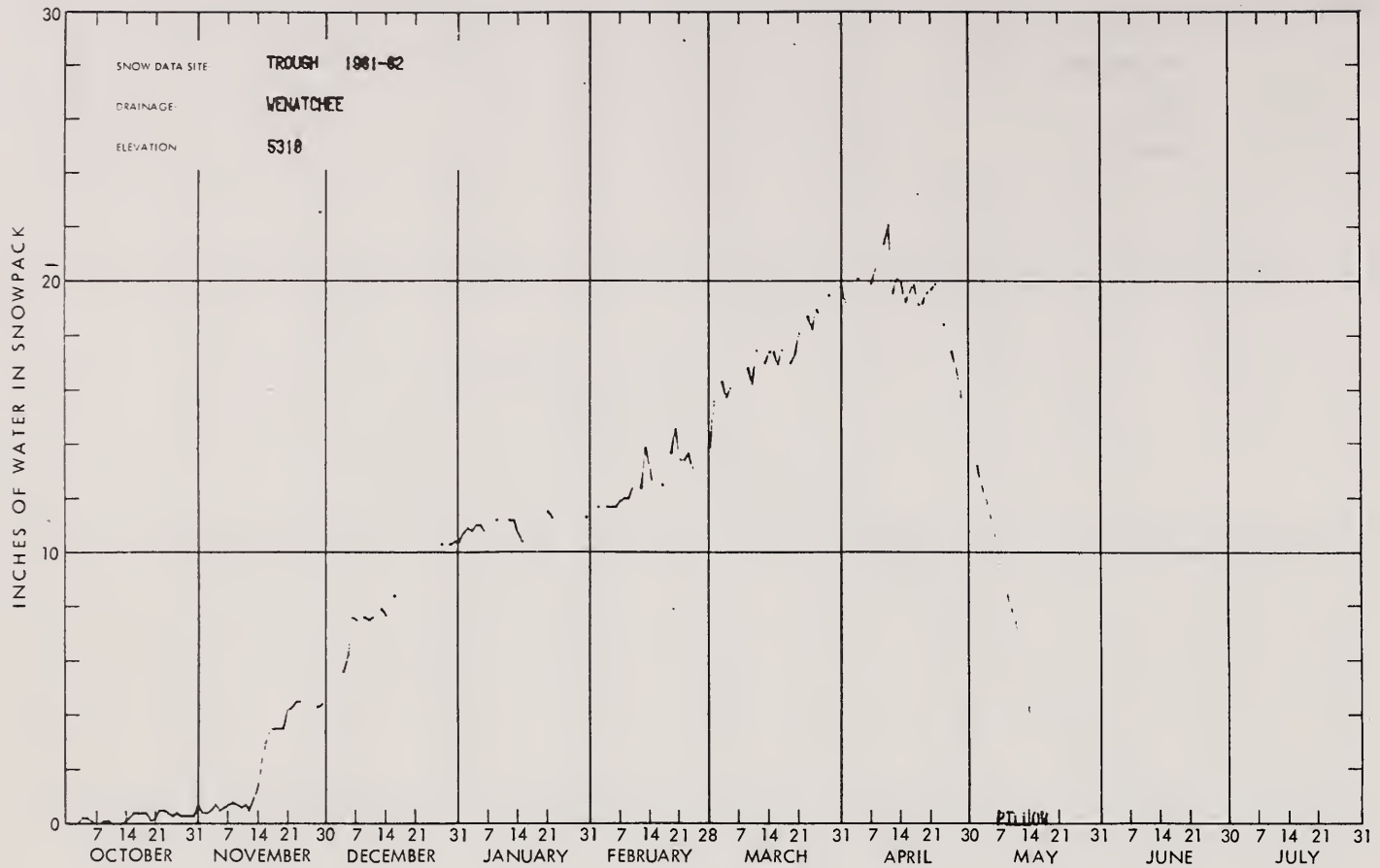


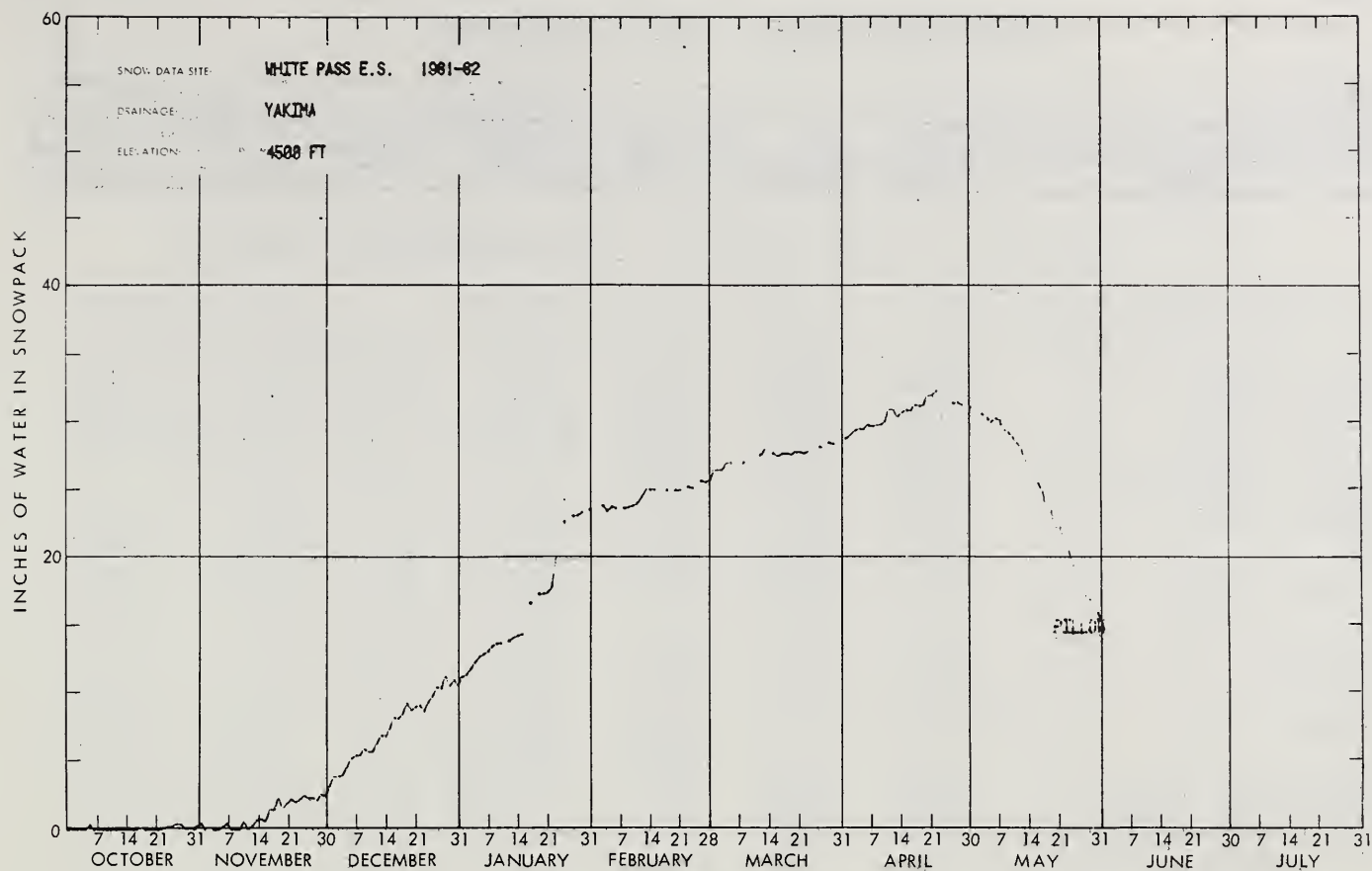












SNOW DATA TO JUNE 1, 1982 - APPENDIX 1

SNOW

DRAINAGE BASIN and/or SNOW COURSE			THIS YEAR			PAST RECORD	
			Date of Survey	Snow Depth (Inches)	Water Content (Inches)	Water Content (Inches)	
NAME	Number	Elevation				Last Year	Average #

U P P E R C O L U M B I A D R A I N A G E

PEND OREILLE RIVER

Baree Creek	15B11	5500	5/13	110	52.8	20.0	41.5
Baree Midway	15B16	4600	5/13	75	35.1	5.5	25.0
Baree Trail	15B15	3800	5/13	0	0.0	0.0	0.0
Heart Lake Trail	14C10	4800	5/31	8	4.0	0.0	-
Hoodoo Basin	15C10	6000	5/14	126	67.0	33.6	50.5
				93	51.1	17.6	39.0
Hoodoo Creek	15C01	5900	5/14	120	60.5	28.7	46.2
				96	49.4	16.9	36.5
Lookout	15B02	5250	5/14	72	32.2	8.6	30.9
			6/1	34	18.2	0.0	15.0
Nelson	2D04-Can	3050	5/14	11	4.8	0.0	0.9*
			6/1	0	0.0	0.0	0.0*
Schweitzer Ridge	16A05	6100	6/1	79	41.8	13.2	-
Schweitzer Bowl	16A06	4500	6/1	16	9.3	-	-

KETTLE RIVER

Big White Mtn.	2E03-Can	5500	5/14	51	22.2	18.1	16.9*
			6/1	26	11.6	7.6	9.7*
Graystoke Lake	2F04-Can	5950	5/14	49	20.6	11.7	19.7*
Monashee Pass	2E01-Can	4500	5/12	30	13.0	8.1	8.5*
			5/28	11	4.9	0.0	1.9*

SPOKANE RIVER

Granite Peak	15B13A	6000	6/1	85	35.8	9.4	31.5
Lookout	15B02	5250	5/14	72	32.2	8.6	30.9
			6/1	34	18.2	0.0	15.0
Lost Lake	15B14A	6000	6/1	108	49.6	16.2	46.4

OKANOGAN RIVER

Aberdeen Lake	1F01A-Can	4300	5/14	2.8	1.1	0.0	0.1*
Blackwall Mountain	2G03-Can	6250	5/14	80	36.7	18.9	34.7*
				Late Report		14.1	27.0*
Brenda Mine	2F18-Can	4800	5/13	17	7.0	1.5	1.9*
			5/31	0	0.0	0.0	0.0*
Brookmere	1C01-Can	3200	5/14	9.4	3.2	0.0	1.7*
			6/1	0	0.0	-	0.0*
Enderby	1F04-Can	6250	5/13	126	55.9	41.7	43.1*
			5/31	97	52.0	33.3	38.6*
Grayback Res.	2F08-Can	5225	5/27	2.4	1.0	0.0	0.9*
Graystoke Lake	2F04-Can	5950	5/14	49	20.6	10.2	19.7*
Hamilton Hill	2G06-Can	4900	5/14	24	11.4	1.4	5.9*

Average based on 1963-1977 period

* Average for years of record

SNOW DATA TO JUNE 1, 1982 - APPENDIX 2

SNOW			THIS YEAR			PAST RECORD	
DRAINAGE BASIN and/or SNOW COURSE			Date of Survey	Snow Depth (Inches)	Water Content (Inches)	Water Content (Inches)	
NAME	Number	Elevation				Last Year	Average #

OKANOGAN RIVER (Cont.)

Isintok Lake	2F11-Can	5510	5/15	18	6.7	0.0	4.1*
Lost Horse Mountain	2G04-Can	6300	5/14	32	10.8	-	9.4*
			6/1	15	6.0	0.9	3.9*
Missezula Mountain	2G05-Can	5100	5/13	14	5.9	0.0	2.2*
Mission Creek	2F05-Can	6000	5/14	6	24.8	16.5	18.9*
			6/1	29	14.7	9.6	12.1*
Monashee Pass	2E01-Can	4500	5/12	30	13.0	8.1	8.5*
			5/28	11	4.9	0.0	1.9*
Mount Kobau	2F12-Can	5950	5/14	42	15.4	9.3	9.3*
			5/30	27	11.4	0.0	3.6*
Silver Star Mountain	2F10-Can	6050	5/15	75	36.9	21.7	25.2*
			5/29	55	27.9	7.0	15.9*
Summerland Reservoir	2F02-Can	4200	5/15	13	5.1	0.0	2.0*
Trout Creek	2F01-Can	4700	5/13	7.5	2.7	0.5	1.6*
Vaseux Creek	2F20-Can	4600	5/14	3.5	1.4	0.0	0.2*
White Rocks Mountain	2F09-Can	6000	5/14	50	23.7	11.6	17.1*
			6/1	19	9.6	0.0	10.2*

ENTIAT RIVER

Blue Creek G.S.	20B28a	5425	5/25	60	30.2	-	26.4*
Entiat Meadows +	20A33a	4540	5/25	30	15.1	-	27.7*
Entiat River Trail +	20A34a	3325	5/25	0	0.0	-	0.0*
Four Mile Ridge +	20B27a	6800	5/25	66	33.3	-	27.3*
Fox Camp +	20A36a	6510	5/25	128	64.5	-	56.6*
Pugh Ridge +	20A32a	6725	5/25	57	28.7	-	27.1*
Shady Pass	20A37	6200	5/26	48	24.3	-	17.1*
Snow Brushy +	20A35a	3910	5/25	21	10.6	-	10.5*
Tommy Creek +	20B21a	4900	5/25	6	3.0	-	3.0*

WENATCHEE RIVER

Stevens Pass	21B01	4070	5/27	82	41.1	0.0	40.6
Stevens Pass Sand Shed	21B45	3700	5/27	35	18.3	0.0	18.7

YAKIMA RIVER

Bumping Lake	21C08	3450	5/13	0	0.0	-	3.6
Bumping Lake New	21C36	3400	5/13	7.8	4.1	-	11.8
Stampede Pass SP	21B10	3860	5/13	88	59.6	2.0	41.7
			5/27	44	26.4	-	26.9
Tunnel Avenue	21B08	2450	5/11	29	14.4	-	14.4
White Pass (E. Side)	21C28	4500	5/12	54	25.5	-	29.1
						-	17.4

Average based on 1963-77 period

* Average for years of record

+ Snow water equivalent estimated from aerial stadia observation

SNOW DATA TO JUNE 1, 1982 - APPENDIX 3

SNOW

DRAINAGE BASIN and/or SNOW COURSE			THIS YEAR			PAST RECORD	
			Date of Survey	Snow Depth (Inches)	Water Content (Inches)	Water Content (Inches)	
NAME	Number	Elevation				Last Year	Average #

CHELAN LAKE BASIN

Little Meadows +	20A24a	5275	5/14	118	55.9	-	-
Lyman Lake	20A23A	5900	5/14	156	74.2	-	-
Park Creek Ridge	20A12A	4600	5/14	97	46.0	-	-

LOWER COLUMBIA DRAINAGELEWIS RIVER

June Lake	22C05	3200	5/15	SNOTEL	11.7	0.0	-
			6/1	SNOTEL	0.0	0.0	-
Lone Pine Shelter	21C26	3800	5/15	SNOTEL	57.9	10.9	-
			5/23	SNOTEL	50.0	0.0	-
Surprise Lakes	21C13A	4250	5/15	SNOTEL	60.3	-	-
			5/24	SNOTEL	49.1	-	-

COWLITZ RIVER

Sheep Canyon	22C10	4050	5/15	SNOTEL	65.0	3.5	-
			6/1	SNOTEL	51.9	0.0	-
Strawberry Landing	22C08	3280	5/14	SNOTEL	71.0	6.1	-
			5/31	SNOTEL	51.6	2.2	-
White Pass (E. Side)	21C28	4500	5/12	54	25.5	-	29.1
						-	17.4

PUGET SOUND DRAINAGEWHITE RIVER

Corral Pass	21B13	6000	5/15	SNOTEL	38.1	-	-
			6/1	SNOTEL	32.0	-	-
Morse Lake	21C17	5400	5/15	SNOTEL	73.2	-	-
			6/1	SNOTEL	60.2	-	-

GREEN RIVER

Cougar Mountain	21B42	3200	5/15	SNOTEL	15.0	-	-
			6/1	SNOTEL	0.0	-	-
Stampede Pass	21B10	3860	5/13	88	59.6	2.0	41.7
			5/27	44	26.4	-	26.9

SKYKOMISH RIVER

Stevens Pass	21B01	4070	5/27	82	41.1	0.0	40.6
Stevens Pass Sand Shed	21B45	3700	5/27	35	18.3	0.0	18.7

Average based on 1963-77 period

+ Snow water equivalent estimated from aerial stadia observation

SNOW DATA TO JUNE 1, 1982 - APPENDIX 4

SNOW			THIS YEAR			PAST RECORD	
DRAINAGE BASIN and/or SNOW COURSE			Date of Survey	Snow Depth (Inches)	Water Content (Inches)	Water Content (inches)	
NAME	Number	Elevation				Last Year	Average #

SKAGIT RIVER

Harts Pass	20A05	6500	5/15	SNOTEL	40.0	-	-
			5/31	SNOTEL	33.1	-	-
Lyman Lake	20A23A	5900	5/14	156	74.2	-	-
Rainy Pass	20A09	4780	5/15	SNOTEL	47.6	-	-
			6/1	SNOTEL	36.2	-	-

BAKER RIVER

Dock Butte	21A11A	3800	5/1	168	79.0	22.0	79.3
				Late Report		-	57.2
Easy Pass	21A07A	5200	5/1	221	104.0	45.0	97.6
				Late Report		-	75.8
Jasper Pass	21A06A	5400	5/1	236	111.0	55.0	99.8
				Late Report		-	85.6
Marten Lake	21A09A	3600	5/1	196	92.0	33.0	87.0
				Late Report		-	68.9
Mount Blum +	21A18a	5800	5/1	184	86.0	-	76.1
				Late Report		-	72.1
Rocky Creek	21A12A	2100	5/1	47	33.0	0.0	28.4
				Late Report		-	2.2
Schreibers Meadow	21A10A	3400	5/1	145	68.0	12.0	70.5
				Late Report		-	46.3
S. F. Thunder Creek	21A14A	2200	5/1	1	0.5	-	2.0
Watson Lakes	21A08A	4500	5/1	151	77.0	23.0	77.7
				Late Report		-	62.6

CORRECTIONS AND ADDITIONS - 1982 SNOW REPORTS

March 1

KETTLE RIVER

Summit G.S.	18A07	4600	2/26	<u>22</u>	6.4	4.1	7.3
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April 1

YAKIMA RIVER & WHITE RIVER

Corral Pass	21B13	6000	4/5	124	<u>51.5</u>	22.4	43.4
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Average based on 1963-77 period

* Average for years of record

+ Snow water equivalent estimated from aerial stadia observation

Agencies Assisting with Snow Surveys

GOVERNMENT AGENCIES

Canada:

Ministry of the Environment, Water
Investigations Branch, Victoria, British Columbia

States:

Washington State Department of Ecology
Washington State Department of Natural Resources

Federal:

Department of the Army
Corps of Engineers
U. S. Department of Agriculture
Forest Service
U. S. Department of Commerce
NOAA, National Weather Service
U. S. Department of the Interior
Bonneville Power Administration
Bureau of Reclamation
Geological Survey
National Park Service

PUBLIC AND PRIVATE UTILITIES

Chelan County P.U.D.
Pacific Power and Light Company
Puget Sound Power and Light Company
Washington Water Power Company

OTHER PUBLIC AGENCIES

Okanogan Irrigation District
Wenatchee Heights Irrigation District

MUNICIPALITIES

City of Tacoma
City of Seattle

Other organizations and individuals furnish valuable information for snow survey reports. Their cooperation is gratefully acknowledged.

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